INERTIAL CONFINEMENT FUSION

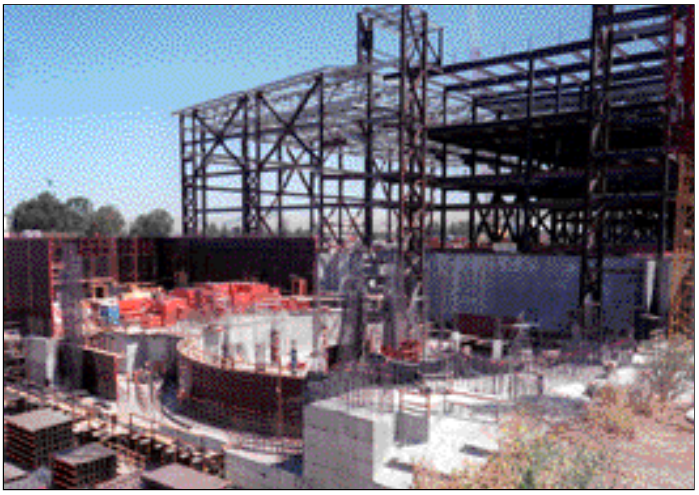
Lawrence Livermore National Laboratory

Monthly Highlights

June 1998

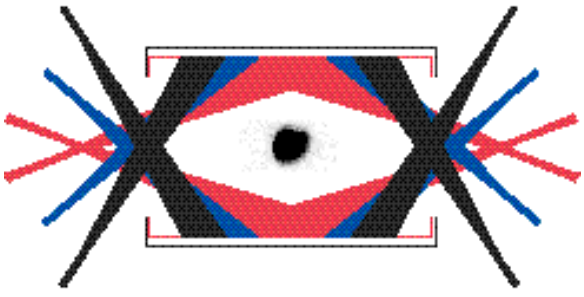
UCRL-TB-128550-98-9

NIF Steel Erected for Laser Bay 2. The Laser Bay 2 steel framework is now 75% installed. The structural steel in the core area of the laser building is completed, and installation of the metal decking in the core area has begun. In the target building, forming for the target bay walls in Switchyard 2 and in the target chamber area is currently being placed.



Laser Bay 2 structural steel erection behind the target area building.

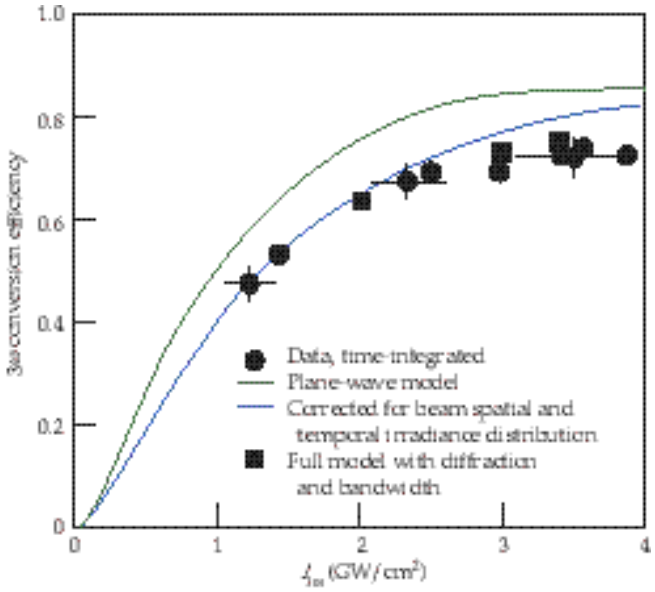
Omega Hohlraums with NIF-Like Beam Geometry Produce Symmetric Implosions. In April, a successful 27-shot week at the Omega laser facility at the Laboratory for Laser Energetics in Rochester, New York, was performed, studying hohlraum x-ray drive symmetry using a 1:5 contrast-shaped laser pulse and a NIF-like multi-cone geometry. Diagnostic techniques included high-magnification (21.5×) x-ray imaging of the imploded core and x-ray backlighting of actual and surrogate targets ("foam ball"). These showed low-order Legendre harmonics asymmetries (P_2,P_4) to be small, with minimal time variation as predicted by simulations (foam-ball-derived values for a_2, a_4, <2 μm). Neutron yields and neutron-based ρR measurements were obtained from implosions with radial convergences of up to 17×. The results demonstrate the use of multiple beams to improve hohlraum drive symmetry.



Omega hohlraum with NIF-like beam geometry, with a superimposed and magnified image of an imploded core after 20 × convergence.

Papers Presented at SSLAC. The Third International Conference on Solid State Lasers for Application to Inertial Confinement Fusion, cosponsored by the U.S. DOE and the French CEA, was held in June in Monterey, California. The conference had about 220 attendees from five other countries and the U.S., and 175 papers were presented. A fourthconference is currently planned to be held in Bordeaux, France, in late 1999.

Efficient 3 ω Conversion with Rapidly Grown Crystals. Beamlet tests have successfully demonstrated efficient frequency conversion to the third-harmonic (3ω) wavelength of Nd:glass using rapidly grown potassium dihydrogen phosphate (KDP) crystals under a CEA / DOE collaboration. NIF-sized crystals (approximately 40 × 40 × 1 cm) are now being produced from boules grown rapidly over 6 to 8 weeks, compared to conventional growth methods that take over one year. The type I second-harmonic generator and type-II third-harmonic generator crystals needed for the Beamlet tests were machined from LLNL boules at Cleveland Crystals, Inc. Maximum extrinsic energy conversion to the third harmonic of 73.5% with an estimated peak-power conversion of 78% was obtained at an amplifier output irradiance of 3.6 GW / cm^2 in a 1.5-ns pulse, in agreement with detailed predictions.



Measured and calculated 3 ω conversion efficiency plotted versus 1ω irradiance of the incident laser pulse.

For comments about content of the *Monthly Highlights*, contact Bob Kauffman (925) 422-0419.
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